

REMARKS/ARGUMENTS

Reconsideration of this application in light of the above amendments and following comments is courteously solicited.

New independent claims 12 and 16 set forth the following particular features of the present invention.

1. Disposed on opposite ends (2a) of a transmitter (2) are a pair of metallic heat sinks (4) on which a semiconductor light emitting element (3) is mounted,
2. A plastic encapsulant (7) is formed with an annular groove (7a) to envelop main and side surfaces (4a) of heat sink (4) by plastic encapsulant (7),
3. Each of heat sinks (4) comprises a reflector (5) integrally formed with or secured on a main surface (4a) of heat sink (4), and
4. Each end (2a) of transmitter (2) is fitted into annular groove (7a) to join each end (2a) of transmitter (2) to reflector (5).

According to the present invention, each of heat sinks (4) importantly has a large and sufficient heat capacity for absorbing heat from light-emitting element (3) and a thermal conductivity for radiating heat to outside. During the lighting operation, heavy current passes through light-emitting element (3) which therefore emits high brightness light and generates plenty of heat. In this case, a large amount of heat from light-emitting element (3) can be radiated through heat sink (4), reflector (5) and each end (2a) of transmitter (2) to outside so that light-emitting element (3) can continue the lighting with high brightness for a long period of time.

In addition, the arrangement can make it very easy to join each end (2a) of transmitter (2) to reflector (5) by fitting each

end (2a) of transmitter (2) into annular groove (7a).

New claim 17 sets forth a patentable feature that total reflection mirrors (21) positioned on the central side of half-mirrors (20) can increase reflected amount of visible light from diode chip (3) toward irradiation surface (2e) of transmitter (2) on the central side.

U.S. Patent No. 6,910,783 discloses a transparent light emitting member 1 in the shape of an elongated rod 2 having a pattern of notches or grooves 3 in a surface 4 of the member 1 for causing light transmitted through the member by internal reflection to be reflected or refracted out of the member 1. As shown in Figure 1, an LED 6 is inserted in a opening 7 formed in the member 1 by an interference fit or by embedding, potting or bonding the light source in place using an embedding, potting or bonding material 8 without any heat sink, plastic encapsulant and fitting feature thereof.

US2003/0116769 shows an LED package which comprises a thin reflective metal plate 120 of less thermal capacity on ceramic substrates 101, 102 of low thermal conductivity thus requiring heat dissipating holes H1 and H2.

US5,583,632 only indicates an optical inspecting apparatus 1 provided with an optical system block 2 having a first half mirror 11 and a reflecting mirror 12 reflected light transmitted from half mirror 11.

JP9-213114 discloses a lighting system comprising a light guide 1 and a plural of half mirror plates 11 of the lower light-reflectivity of 20% and the higher light-reflectivity of 30% arranged in light guide 1.

The four prior art references referred to above taken alone or in combination fail to teach, disclose, suggest or render obvious the particular features of the present invention as set forth in independent claims 12 and 16. Thus, the prior art fails

to render obvious the four features discussed above which are again listed hereinbelow for convenience.

1. Disposed on opposite ends (2a) of a transmitter (2) are a pair of metallic heat sinks (4) on which a semiconductor light emitting element (3) is mounted,
2. A plastic encapsulant (7) is formed with an annular groove (7a) to envelop main and side surfaces (4a) of heat sink (4) by plastic encapsulant (7),
3. Each of heat sinks (4) comprises a reflector (5) integrally formed with or secured on a main surface (4a) of heat sink (4), and
4. Each end (2a) of transmitter (2) is fitted into annular groove (7a) to join each end (2a) of transmitter (2) to reflector (5).

With regard to independent claim 17, the four cited and applied prior art references fail to teach the increase in the reflected amount of visible light from the diode chip towards the irradiation surface of the transmitter tube by the position of the reflection mirrors vis-à-vis the half mirrors.

In light of the foregoing, it is respectfully submitted that all of the claims as pending patentably define over the art of record and an early indication of same is respectfully requested.

An earnest and thorough attempt has been made by the undersigned to resolve the outstanding issues in this case and place same in condition for allowance. If the Examiner has any questions or feels that a telephone or personal interview would be helpful in resolving any outstanding issues which remain in this application after consideration of this amendment, the Examiner is courteously invited to telephone the undersigned and the same would be gratefully appreciated.

It is submitted that the claims as amended herein patentably define over the art relied on by the Examiner and early allowance

of same is courteously solicited.

If any fees are required in connection with this case, it is respectfully requested that they be charged to Deposit Account No. 02-0184.

Respectfully submitted,

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